

Fishery Data Series No. 93-31

**Angler Effort and Harvest of Coho Salmon
During the Recreational Fisheries in the
Lower Kenai River, 1992**

by

Mary A. Schwager-King

September 1993

Alaska Department of Fish and Game

Division of Sport Fish



FISHERY DATA SERIES NO. 93-31
ANGLER EFFORT AND HARVEST OF COHO SALMON
DURING THE RECREATIONAL FISHERIES IN
THE LOWER KENAI RIVER, 1992¹

By
Mary A. Schwager-King

Alaska Department of Fish and Game
Division of Sport Fish
Anchorage, Alaska

September 1993

¹ This information was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-8, Job No. S-2-14(b).

The Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Fishery Data Series reports are intended for fishery and other technical professionals. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone editorial and peer review.

The Alaska Department of Fish and Game receives federal funding. All of its public programs and activities are operated free from discrimination on the basis of race, religion, sex, color, national origin, age, or handicap. Any person who believes he or she has been discriminated against by this agency should write to:

OEO
U.S. Department of the Interior
Washington, D.C. 20240

TABLE OF CONTENTS

	<u>Page</u>
LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
LIST OF APPENDICES.....	iv
ABSTRACT.....	1
INTRODUCTION.....	2
Background.....	2
Description of the Kenai River Coho Salmon Sport Fishery.....	5
Regulations Governing the Sport Fishery.....	5
Objectives.....	6
METHODS.....	6
Creel Survey.....	6
Age, Sex, and Size Data.....	11
RESULTS AND DISCUSSION.....	12
Creel Statistics.....	12
Effort.....	12
Harvest and Catch.....	12
Summary.....	14
Biological Data.....	14
RECOMMENDATIONS.....	22
ACKNOWLEDGEMENTS.....	22
LITERATURE CITED.....	23
APPENDIX A: Counts of anglers during the creel survey of the fishery for coho salmon in the downstream section of the Kenai River, Alaska, 1992.....	27
APPENDIX B: Daily summary statistics for fishing effort, harvest rate, and catch rate for anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River, Alaska, 1992.....	31

LIST OF TABLES

<u>Table</u>	<u>Page</u>
1. Estimated effort in angler-hours during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992.....	13
2. Estimated harvest during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992.....	15
3. Estimated catch during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992.....	16
4. Summary of angler effort, harvest, HPUE, catch, and CPUE of coho salmon during August and September in the downstream section of the Kenai River, 1992.....	18
5. Estimated number, by sex and age class, of coho salmon harvested by the recreational fishery in the downstream section of the Kenai River, 1992.....	20
6. Age composition and mean length at age of coho salmon sampled from the recreational harvest during the fishery for coho salmon in the downstream section of the Kenai River, 1992.....	21

LIST OF FIGURES

<u>Figure</u>	<u>Page</u>
1. Map of the Kenai River drainage.....	3
2. Historical harvest and effort in the recreational fishery for coho salmon in the downstream section of the Kenai River, 1976-1992.....	4
3. Number of coho salmon harvested per angler-hour by recreational anglers fishing in the downstream section of the Kenai River, 1 August through 28 September 1992.....	17
4. Historical effort of guided and unguided anglers (includes both boat and shore anglers) in the recreational fishery for coho salmon in the downstream section of the Kenai River 1986-1992.....	19

LIST OF APPENDICES

<u>Appendix</u>	<u>Page</u>
A1. Angler counts by stratum during the recreational fishery for coho salmon in the downstream section of the Kenai River, during August 1992.....	28
A2. Angler counts by stratum during the recreational fishery for coho salmon in the downstream section of the Kenai River, during September 1992.....	29
B1. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum for guided boat anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.....	32
B2. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum for unguided boat anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.....	33
B3. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum for shore anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.....	34
B4. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum for guided anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.....	35
B5. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for unguided anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.....	36
B6. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum, for shore anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.....	37

ABSTRACT

A creel survey was conducted from 1 August through 28 September 1992 on the downstream section of the Kenai River (Soldotna Bridge to Cook Inlet) to estimate recreational angler effort and catch and harvest of coho salmon *Oncorhynchus kisutch*. During this time period, the recreational fishery is primarily directed toward coho salmon. Results from this survey showed recreational anglers exerted an estimated 176,554 angler-hours to harvest an estimated 20,817 coho salmon during the early (August) coho salmon run and an estimated 65,520 angler-hours to harvest an estimated 12,794 coho salmon during the late (September) coho salmon run. The total catch exceeded the harvest for both runs by less than 1%, as most fish caught were retained. More effort (73%) was expended by anglers during the early run than the late run. For both early and late runs more angler effort occurred on weekdays (57% and 61%, respectively) and during morning periods (57% and 75%, respectively). Over both runs, unguided boat anglers exerted 55% of the total effort and harvested 47% of the coho salmon while guided boat anglers exerted 29% of the effort and harvested 45% of the coho salmon. Only 16% of effort and 8% of harvest was attributed to shore anglers. The predominant age class in each run was age 2.1 (73% of the early run and 91% of the late run). Late-run coho salmon tended to have larger mean lengths than early-run coho salmon. More males than females were harvested during both early and late runs (59% and 55%, respectively).

KEY WORDS: Kenai River, coho salmon, creel survey, effort, harvest, *Oncorhynchus kisutch*.

INTRODUCTION

Background

Coho salmon *Oncorhynchus kisutch* return annually to the Kenai River (Figure 1) in two temporal components, termed early and late runs. The early-run stock typically enters the river from late July through August while the late-run stock typically begins entering the river in early September. There has been no exact determination on the duration of the return of the late-run stock; however, fish have been observed spawning into late March. Early-run fish are believed to spawn predominantly in tributaries of the Kenai River while late-run fish are believed to spawn predominantly in the mainstem (Booth 1990).

The early- and late-run coho salmon stocks of the Kenai River support the largest freshwater sport fisheries for coho salmon in Alaska with over 76,000 taken by sport anglers in 1991 (Mills 1992). Effort and harvest have generally increased annually since 1976, now exceeding 150,000 angler-hours and 20,000 coho salmon for the early run and 50,000 angler-hours and 15,000 coho salmon for the late run (Figure 2). The economic value of these fisheries during 1986 was estimated at 3.9 million dollars for the early run and 4.6 million dollars for the late run (Jones and Stokes 1987). At that time, recreational anglers also expressed an additional net willingness to support these fisheries of 3.0 million dollars for the early run and 2.8 million dollars for the late run.

The early-run stock and, to a lesser degree, the late-run stock of coho salmon from the Kenai River contribute significantly to mixed-stock commercial fisheries that occur in the marine waters of Upper Cook Inlet (UCI). These fisheries are second only in terms of coho salmon harvest to those in Southeast Alaska (Meyer et al. *Unpublished*). From 1977 through 1989, UCI commercial fisheries harvested just over 450,000 coho salmon annually. Major UCI commercial fisheries that are believed to intercept large numbers of Kenai River coho salmon include the drift and set gill net fisheries in the Central District. Kenai River coho salmon stocks also support various subsistence and personal-use fisheries in UCI. Harvests in these fisheries have been relatively small, averaging approximately 2,500 fish annually from 1986 through 1990, until the recent allocative decision by the Alaska Board of Fisheries to liberalize subsistence fisheries. The harvest increased to 3,107 in 1991 (D. Nelson, ADF&G, personal communication) and to 5,240 in 1992 (J. Fox, ADF&G, personal communication) for the subsistence dip net and gill net fisheries in the Central District of UCI.

The stock-specific contributions of Kenai River coho salmon to the mixed-stock fisheries and the magnitude of escapements is unknown. Without this information, sustainable exploitation rates cannot be determined. This lack of knowledge about the Kenai River coho salmon stocks and exploiting fisheries suggests a conservative approach to management. However, the growing nature of the fisheries exploiting these stocks, coupled with the lack of quantifiable information, raise fears that these stocks may be in danger of overexploitation.

To provide data required to define meaningful management objectives and strategies, a long-term study has been initiated to assess the status and

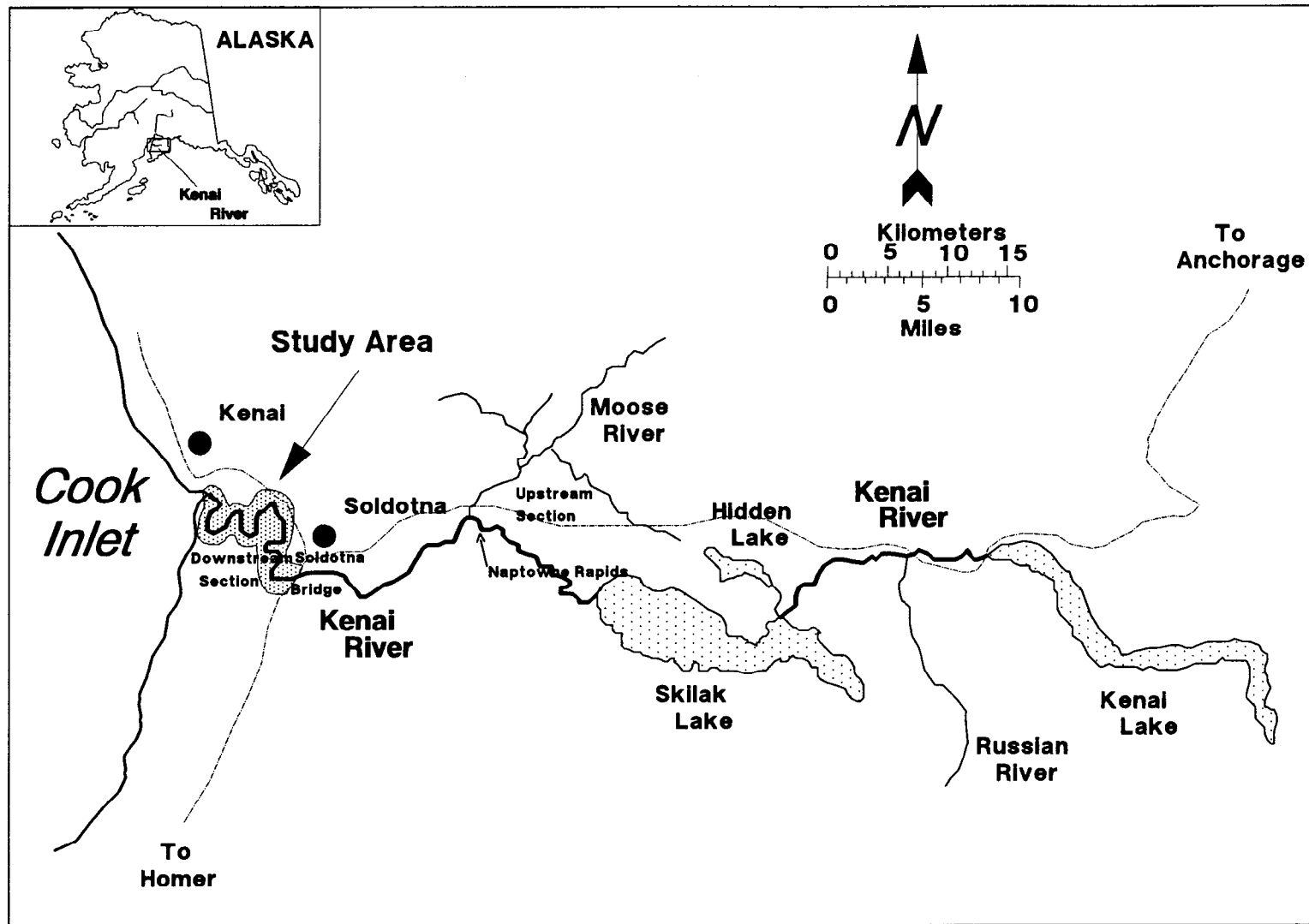


Figure 1. Map of the Kenai River drainage.

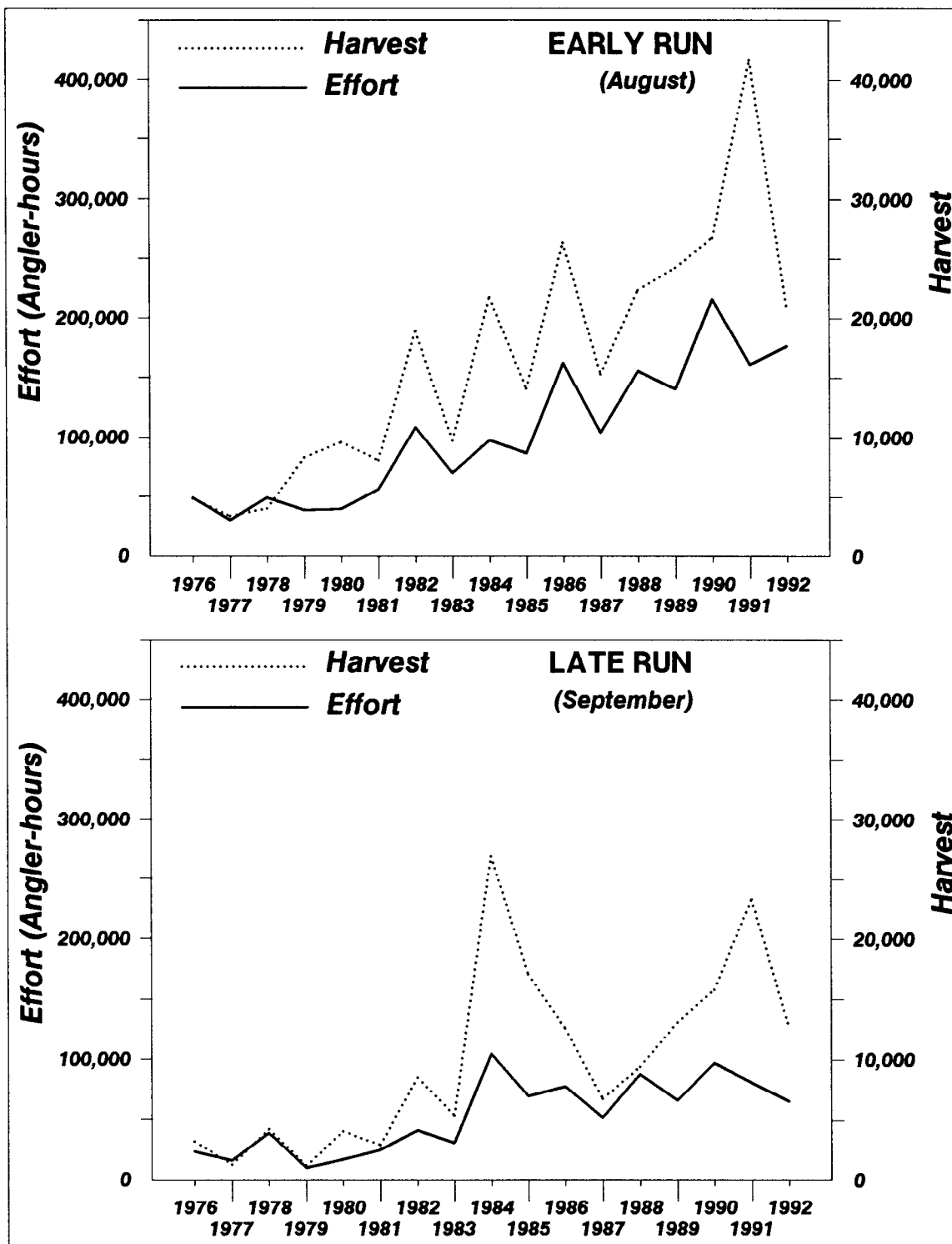


Figure 2. Historical harvest and effort in the recreational fishery for coho salmon in the downstream section of the Kenai River, 1976-1992.

sustained yields of the early and late Kenai River coho salmon stocks (Meyer et al. *Unpublished*). As part of this long-term effort, recreational harvests of early- and late-run coho salmon stocks in the Kenai River are estimated annually. In combination with other studies, results of these efforts will provide the data necessary to estimate the productivity of the Kenai River coho salmon resource. This information will be used to define meaningful management objectives and strategies that assure for the sustainable exploitation for this resource.

Description of the Kenai River Coho Salmon Sport Fishery

The recreational fishery targeting coho salmon in the Kenai River usually begins after the closure of the chinook salmon *O. tshawytscha* sport fishery on 31 July. During most years, anglers have reported few coho salmon being caught during the directed chinook salmon fishery prior to 1 August. Although late run fish continue to enter the river after 1 October, effort typically declines rapidly due to cold weather and shorter daylight periods.

The directed coho salmon fishery in the Kenai River is unlike that which targets chinook salmon. While the sport fishery targeting chinook salmon is highly mobile and fluid, the sport fishery targeting coho salmon is much more stationary. Boat anglers typically anchor their boats near a favorite "hole", after launching at developed boat launches and campgrounds. In addition, shore anglers fish for coho salmon along the banks of the Kenai River. In the past, most of the anglers have been unguided, however in recent years guided boat anglers have accounted for a larger portion of the recreational effort.

Most anglers fish for coho salmon in the mainstem Kenai River either downstream from the Soldotna Bridge (downstream section) or from Skilak Lake to the Naptowne Rapids¹ (upstream section) (Figure 1). In past years, an upstream creel survey was conducted but in 1992 this survey was precluded due to budget constraints. Harvest in the upstream section is relatively small (average <15% of the harvest in the other mainstem areas; Mills 1985-1992). Coho salmon are also harvested in the mainstem between these two river sections, past surveys have shown the number harvested to be small (typically <15% of the harvest in the other mainstem areas; Mills 1985-1992).

Previous information pertaining to the coho salmon fishery in the Kenai River is presented in Hammarstrom (1977 and 1978, 1988-1991), Wallis and Hammarstrom (1979-1984), Hammarstrom et al. (1985), Hammarstrom and Larson (1986), and Conrad and Hammarstrom (1987). In addition, angler-effort and harvest by species for the recreational fishery in the Kenai River have been estimated by Mills (1979-1992).

Regulations Governing the Sport Fishery

For the Kenai River, coho salmon are categorized with salmon other than chinook salmon and have aggregate bag and possession limits. During 1992, the aggregate daily bag and possession limits were three salmon 41 cm in length or greater with no annual limit. There was no limitation or restriction on the use of bait other than the prohibition of the use of live bait.

¹ This landmark is just upstream of the Moose River confluence which is used to delineate areas of harvest by Mills (1979-1992).

Additionally, there were no time/day closures or restrictions on the fishery. Lastly, guides were permitted to fish while guiding clients.

Objectives

The objectives of the 1992 studies were to:

1. estimate total recreational harvest and catch of coho salmon in the mainstem Kenai River downstream from the Soldotna Bridge during the period from 1 August through 30 September 1992;
2. estimate recreational angler effort in the mainstem Kenai River downstream from the Soldotna Bridge during the period from 1 August through 30 September 1992; and,
3. estimate the age, sex, and length compositions of coho salmon harvested during the recreational fishery in the mainstem Kenai River downstream from the Soldotna Bridge during the period from 1 August through 30 September 1992.

METHODS

Creel Survey

A roving creel survey (Neuhold and Lu 1957) was used to estimate sport fishing effort in units of angler-hours fished. Angler interviews were used to estimate both harvest per unit of effort (HPUE, in units of numbers of coho salmon harvested per angler-hour fished), and catch per unit of effort (CPUE, in units of numbers of coho salmon caught per angler-hour fished). Harvest and catch were estimated as the product of the estimated effort and HPUE or CPUE, respectively. Harvest refers to fish retained by anglers as part of their creel and catch refers to fish retained plus those reported to be released by anglers.

The survey was based on a two stage sample design. The first stage represented days surveyed which were stratified into two periods: morning (0600-1359 hours, August; 0800-1359 hours, September) and afternoon (1400-2159 hours, August; 1400-1959 hours, September). The second stage represented anglers and counts within a period. The survey was divided into two seasonal strata: early run (August) and late run (September). Sampling was also stratified by day type: weekday and weekend (Saturdays, Sundays, and legal holidays). Sample days were randomly chosen and once a period was selected the entire period was sampled. Postseason, the data were further stratified into boat and shore anglers and into guided and unguided anglers. Thus, there was a total of 24 strata:

1. August weekday morning unguided boat
2. August weekday afternoon unguided boat
3. August weekend morning unguided boat
4. August weekend afternoon unguided boat
5. August weekday morning guided boat
6. August weekday afternoon guided boat
7. August weekend morning guided boat

8. August weekend afternoon guided boat
9. August weekday morning unguided shore
10. August weekday afternoon unguided shore
11. August weekend morning unguided shore
12. August weekend afternoon unguided shore
13. September weekday morning unguided boat
14. September weekday afternoon unguided boat
15. September weekend morning unguided boat
16. September weekend afternoon unguided boat
17. September weekday morning guided boat
18. September weekday afternoon guided boat
19. September weekend morning guided boat
20. September weekend afternoon guided boat
21. September weekday morning unguided shore
22. September weekday afternoon unguided shore
23. September weekend morning unguided shore
24. September weekend afternoon unguided shore

Sampling levels were designed to estimate effort to within $\pm 10\%$ and harvest and catch to within $\pm 25\%$ of their true values 95% of the time. During August, 22 days were scheduled for sampling: 13 weekday days (9 mornings and 9 afternoons) and 9 weekend days (6 mornings and 5 afternoons). During September, 22 days were scheduled for sampling: 14 weekday days (9 mornings and 8 afternoons) and 8 weekend days (5 mornings and 5 afternoons). Some deviation from the schedule occurred due to mechanical breakdown and other duties such as public assistance or enforcement activities. Three people conducted the survey: one creel clerk worked from a boat and two creel clerks were stationed at access points.

Angler counts were conducted during all scheduled sampling periods. Counts were conducted using a boat driven at a constant rate of speed through the length of the survey area, starting at one end of the area. The trip usually took 45 minutes or less to complete and every effort was made to ensure the trip was completed within 1 hour. Angler counts were considered instantaneous and reflected fishing effort at the time of the count. During each count, the survey clerk recorded the following information: (1) total number of unguided boats, (2) total number of guided boats, (3) total number of anglers in unguided boats, (4) total number of anglers in guided boats, and (5) total number of shore anglers.

Angler interviews were conducted during all scheduled sampling periods. This enabled angler counts (effort) to be related with angler interviews (HPUE or CPUE estimates). The interviews were conducted by two access clerks and augmented by the boat creel clerk as time permitted. Four interview locations (two per access clerk) were randomly selected with the interview periods lasting 3.5 hours at each location during August and 3.0 hours at each location during September. The clerks attempted to interview all anglers departing the fishery at each surveyed access site during a sampling period. Only completed anglers were interviewed with the following information obtained from each interviewed angler: (1) the river section the angler fished, (2) whether the angler fished from a boat or shore (and if a boat was used whether it was a motorized or nonmotorized boat), (3) whether the angler was guided or unguided, (4) the total number of hours the angler fished,

(5) the total number of fish the angler harvested (kept) by species, and (6) the total number of fish the angler released by species.

Total effort, catch, and harvest were estimated by expanding means over all periods sampled in a stratum h. For any period i sampled, three counts were made unless mechanical failure compromised the schedule. The mean count \bar{x}_i for period i was estimated as:

$$\bar{x}_i = \frac{\sum_{j=1}^{r_i} x_{ij}}{r_i} \quad (1)$$

where:

x_{ij} = the number of anglers observed in the jth count of period i
and
 r_i = the number of counts in period i, normally three.

Angler counts were systematically selected within a period and the variance of the mean angler count was estimated as:

$$\text{Var}(\bar{x}_i) = \frac{\sum_{j=2}^{r_i} (x_{ij} - x_{i(j-1)})^2}{2r_i(r_i-1)} \quad (2)$$

Effort for period i in stratum h was estimated as:

$$\hat{E}_{hi} = L_h \bar{x}_i \quad (3)$$

where:

\hat{E}_{hi} = effort for period i in angler-hours during stratum h and
 L_h = length of period in hours in stratum h, which was 8 hours in August and 6 hours in September.

The within period variance of the effort for period i in stratum h was estimated as:

$$\text{Var}(\hat{E}_{hi}) = L_h^2 \text{Var}(\bar{x}_i) \quad (4)$$

The mean effort for stratum h was estimated as:

$$\bar{E}_h = \frac{\sum_{i=1}^d E_{hi}}{d} \quad (5)$$

where:

\bar{E}_h = mean effort for stratum h and

d = number of periods (or days) sampled in stratum h.

Sampling periods (morning or afternoon) were chosen randomly. The variance of mean effort was estimated as:

$$S_{Ehi}^2 = \frac{\sum_{i=1}^d (E_{hi} - \bar{E}_h)^2}{(d-1)} \quad (6)$$

Total effort for strata h was estimated as:

$$\hat{E}_h = D \bar{E}_h \quad (7)$$

where:

\hat{E}_h = total effort for stratum h and

D = total number of periods in stratum h.

The variance of total effort for the stratum in a two stage design was estimated by (Cochran 1977):

$$\text{Var}(\hat{E}_h) = (1-f) D^2 \frac{S_{Ehi}^2}{d} + f D^2 \frac{\sum_{i=1}^d \text{Var}(\hat{E}_{hi})}{d^2} \quad (8)$$

where,

f = finite population correction factor for periods (days) sampled

= d/D

Catch and harvest per unit of effort were estimated from angler interviews of each sampled period using jackknife methods to minimize the bias of these ratio estimators (Efron 1982).

A jackknife estimate of CPUE (or HPUE) was made for each angler as:

$$CPUE_{hij}^* = \frac{\sum_{k=1}^{m_{hi}} c_{hik}}{\sum_{k=1}^{m_{hi}} e_{hik}} \quad (9)$$

where:

$$\begin{aligned} CPUE_{hij}^* &= \text{jackknife estimate for angler } j, \\ c_{hik} &= \text{catch for angler } k \text{ interviewed in period } i \text{ of stratum } h, \\ e_{hik} &= \text{effort (in hours fished) for angler } k \text{ interviewed in} \\ &\quad \text{period } i \text{ of stratum } h, \text{ and} \\ m_{hi} &= \text{number of anglers interviewed in period } i \text{ of stratum } h. \end{aligned}$$

The jackknife estimate of mean CPUE for period i was the mean of the angler estimates:

$$\overline{CPUE_{hi}}^* = \frac{\sum_{j=1}^{m_{hi}} CPUE_{hij}^*}{m_{hi}} \quad (10)$$

and the bias corrected mean was estimated as:

$$\overline{CPUE_{hi}}^{**} = (m_{hi} - 1) (\overline{CPUE_{hi}}^* - \overline{CPUE_{hi}}^*) + \overline{CPUE_{hi}}^* \quad (11)$$

where:

$$\overline{CPUE_{hi}} = \frac{\sum_{h=1}^H \sum_{i=1}^I \sum_{k=1}^{m_{hi}} c_{hik}}{\sum_{h=1}^H \sum_{i=1}^I m_{hi}}$$

= the standard estimate of CPUE, or the sum of all catches over the sum of all hours fished in a period.

The variance of the jackknife estimate of CPUE was estimated as:

$$Var(\overline{CPUE_{hi}}^{**}) = \frac{(m_{hi} - 1)}{m_{hi}} \sum_{j=1}^{m_{hi}} (\overline{CPUE_{hij}}^* - \overline{CPUE_{hi}}^*)^2. \quad (12)$$

The estimate of HPUE was made as for CPUE, substituting angler harvest for angler catch in equations (9) through (12) above.

Catch for the sample period was then estimated as the product of effort and CPUE:

$$\hat{C}_{hi} = \hat{E}_{hi} \overline{CPUE_{hi}}^{**} \quad (13)$$

and the variance as (Goodman 1960):

$$\begin{aligned} \text{Var}(\hat{C}_{hi}) = & \text{Var}(\hat{E}_{hi}) (\overline{CPUE_{hi}}^{**})^2 + \text{Var}(\overline{CPUE_{hi}}^{**}) \hat{E}_{hi}^2 - \\ & \text{Var}(\overline{CPUE_{hi}}^{**}) \hat{E}_{hi}. \end{aligned} \quad (14)$$

Harvest for sample period i was estimated by substituting the appropriate HPUE_{hi} statistics into equations (13) and (14).

Total catch and harvest for stratum h was estimated using equations (5) through (8) above for effort, substituting estimated sample period catch (\hat{C}_{hi}) or harvest (\hat{H}_{hi}) for sample period effort (\hat{E}_{hi}).

The estimates of total effort, catch, or harvest and their variances were summed across strata as these estimates were considered independent.

The major assumptions necessary for these analyses are:

1. significant fishing effort occurred only between the hours defined for the angler day;
2. individual effort and harvest (or catch) by anglers were normally distributed random variables; and,
3. anglers were interviewed in constant proportions to their abundance within each stratum (DiCostanzo 1956) and interviewed anglers were representative of the total angler population.

Age, Sex, and Size Data

Harvested coho salmon observed during angler interviews were systematically selected (the first ten fish observed by the interview clerks) for biological sampling. For each run, a minimum sample size of 125 coho salmon was obtained. This sample size enabled estimates of age composition of the total harvest to be within $\pm 10\%$ of the true value 95% of the time, allowing for 15% scale regeneration (Thompson 1987). For each fish, the mid-eye to fork-of-tail length was measured to the nearest five millimeters, the sex was identified, and three scales were removed from the preferred area (Scarnecchia 1979). Scales were placed on adhesive-coated cards which were later heat pressed to make scale impressions on acetate cards. These scale impressions, enlarged with the use of a microfiche reader, were used to determine ages.

Proportional age composition of the coho salmon harvest during each run was estimated. Letting p_{gt} equal the estimated proportion of age group g in component t, the variance of p_{gt} was estimated as (Scheaffer et al. 1979):

$$V(\hat{p}_{gt}) = \hat{p}_{gt}(1-\hat{p}_{gt})/(\hat{n}_{gt}-1) \quad (15)$$

where \hat{n}_{gt} equals the number of legible scales read from coho salmon sampled during run t .

A chi-square test was utilized to detect differences in age composition between early and late runs. Student's t -test was used to examine differences in mean lengths at age, by sex, between runs. All tests were conducted at $\alpha = 0.05$

RESULTS AND DISCUSSION

Creel Statistics

Angler counts and interviews were conducted on 21 of 31 possible days in August and 22 of 30 possible days in September. The late run coho salmon creel survey was terminated on 28 September due to unseasonably cold weather impacting outboard performance and due to low water levels in the Kenai River causing concern for safe navigation.

Effort:

During the early run, angler counts ranged from 23 to 564 for unguided anglers, from 0 to 260 for guided anglers, and from 0 to 363 for shore anglers (Appendix A1). The largest count occurred for unguided anglers on 15 August, for guided anglers on 15 August, and for shore anglers on 22 August. During the late run, angler counts ranged from 6 to 352 for unguided anglers, from 0 to 173 for guided anglers, and from 3 to 115 for shore anglers (Appendix A2). The largest count occurred for unguided anglers on 7 September, for guided anglers on 12 September, and for shore anglers on 17 September.

The total estimated effort for the early run (176,554 angler hours, SE = 5,235) was more than twice that of the late run (65,520 angler hours, SE = 3,249) (Table 1).

During both early and late runs, angler effort was greater during the A period (morning) than the B period (afternoon). The A period effort was 57% of the total effort for the early run and 75% of the total effort for the late run (Table 1). For both early and late runs, the weekday effort was greater than the weekend effort at 57% and 61%, respectively (Table 1). This difference was largely due to the difference in effort of guided anglers on weekdays relative to weekends. The total guided weekday effort was twice that of the total guided weekend effort. A comparison of effort by angler type showed unguided anglers with the highest percent of the total effort (55% for both early and late runs), guided anglers with the next highest (28% for the early run and 31% for the late run), and shore anglers with the lowest (17% for the early run and 14% for the late run) (Table 1).

Harvest and Catch:

A total of 2,214 completed-trip angler interviews were conducted, 1,270 during the early run (27% guided, 70% unguided, and 3% shore anglers) and 944 during

Table 1. Estimated effort in angler-hours during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992

Angler Type	WE/WD ^a	Estimated Effort	Standard Error	95% Confidence Interval		Relative Precision	
AUGUST							
Period A (0600-1359)							
Guided	WD	22,836	2,404	18,124	-	27,547	20.6 %
	WE	12,573	1,235	10,152	-	14,994	19.3 %
Unguided	WD	26,270	1,359	23,607	-	28,933	10.1 %
	WE	24,222	774	22,704	-	25,740	6.3 %
Shore	WD	8,456	1,397	5,719	-	11,193	32.4 %
	WE	5,849	863	4,157	-	7,540	28.9 %
Total Period A		100,206	3,528	93,292	-	107,120	6.9 %
Period B (1400-2159)							
Guided	WD	9,765	1,471	6,882	-	12,648	29.5 %
	WE	4,693	656	3,408	-	5,978	27.4 %
Unguided	WD	24,206	2,400	19,502	-	28,910	19.4 %
	WE	22,112	1,431	19,308	-	24,916	12.7 %
Shore	WD	8,974	1,067	6,882	-	11,066	23.3 %
	WE	6,597	1,849	2,974	-	10,220	54.9 %
Total Period B		76,348	3,867	68,768	-	83,928	9.9 %
Total August		176,554	5,235	166,294	-	186,813	5.8 %
SEPTEMBER							
Period A (0800-1359)							
Guided	WD	10,939	1,328	8,335	-	13,542	23.8 %
	WE	5,640	670	4,327	-	6,953	23.3 %
Unguided	WD	13,932	1,473	11,046	-	16,819	20.7 %
	WE	12,843	1,528	9,849	-	15,838	23.3 %
Shore	WD	3,168	666	1,863	-	4,473	41.2 %
	WE	2,397	360	1,692	-	3,102	29.4 %
Total Period A		48,919	2,700	43,627	-	54,211	10.8 %
Period B (1400-1959)							
Guided	WD	3,018	823	1,405	-	4,632	53.5 %
	WE	1,157	436	302	-	2,011	73.8 %
Unguided	WD	6,455	1,221	4,061	-	8,848	37.1 %
	WE	2,502	794	947	-	4,057	62.2 %
Shore	WD	2,524	498	1,549	-	3,500	38.6 %
	WE	945	180	593	-	1,297	37.3 %
Total Period B		16,601	1,808	13,057	-	20,144	21.3 %
Total September		65,520	3,249	59,151	-	71,888	9.7 %

^a WE = Weekend, WD = Weekday.

the late run (29% guided, 61% unguided, and 10% shore anglers) (Appendices B1-B6).

For the early run, the estimated harvest of 20,817 coho salmon (SE = 2,254) was 99.3% of the estimated catch of 20,959 coho salmon (SE = 2,277) and for the late run, the estimated harvest of 12,794 coho salmon (SE = 1,367) was 99.9% of the estimated catch of 12,806 coho salmon (SE = 1367) (Tables 2 and 3). For both fisheries nearly all coho salmon caught were retained, i.e. catch and harvest were approximately equal.

The estimated harvest of both fisheries during Period A (morning) was at least twice that of Period B (afternoon) (Table 2). The harvest rate (HPUE) was also greater during Period A than Period B for all angler types in both fisheries (Figure 3). For the early- and late-run coho salmon fisheries, more than 60% of the total estimated harvest occurred on weekdays (Table 4). The guided and unguided anglers accounted for similar proportions of the harvest: 46% each for the early run, and 44% and 50%, respectively, for the late run. Shore anglers took less than 10% of the total harvest in each run. In the early run, the harvest rate for guided anglers (0.191) was nearly twice that of unguided anglers (0.098) which was nearly twice that of shore anglers (0.059). In the late run, guided anglers also had the highest rate of harvest (0.274), followed by unguided anglers (0.179) and shore anglers (0.079).

Summary:

Estimates of effort, catch, and harvest were within desired levels of precision and accuracy specified by the project design. Although harvest during 1992 was lower than in 1991, 1992 effort and harvest estimates suggest an increasing trend in the early-run fishery and to a lesser degree, in the late-run fishery (Figure 2). Effort by anglers utilizing professional guides is also increasing and these anglers have higher HPUE for coho salmon (Table 4 Figure 4.)

HPUE data suggest that early-run coho salmon entered the fishery about 8-10 August and were gone by about 25 August. Late-run fish then entered the fishery about 1 September, validating the August-September split of the creel survey.

Biological Data

Age composition data were used to estimate harvests by sex and age class (Table 5). There was a significant difference ($\chi^2 = 36.08$, $df = 2$, $P < 0.001$) in the age compositions of coho salmon harvested during August and September. There was no significant difference in the age composition between 2-week time strata within each run (early run: $\chi^2 = 2.9$, $df = 2$, $P = 2.3$; late run: $\chi^2 = 1.3$, $df = 2$, $P = 5.2$). The predominant age class in both the early- and late-run harvests was age-2.1 which comprised 73.4% and 90.6% of the samples, respectively (Tables 5 and 6). Only two other age classes were significantly represented in the sample: age 1.1 (21.8% of the early run, 3.4% of the late run) and age 3.1 (2.6% of the early run, 5.1% of the late run). More males were harvested than females during both the early and late runs.

Both male ($t = 4.14$, $df = 220$, $p < 0.0001$) and female ($t = 2.15$, $df = 156$, $p = 0.016$) age-2.1 coho salmon had greater mean lengths during the late run than

Table 2. Estimated harvest during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992.

Angler Type	WE/WD ^a	Estimated Harvest	Standard Error	95% Confidence Interval		Relative Precision	
AUGUST							
Period A (0600-1359)							
Guided	WD	5,285	1,371	2,599	-	7,971	50.8 %
	WE	2,394	574	1,268	-	12,624	47.0 %
Unguided	WD	3,498	859	1,815	-	5,181	48.1 %
	WE	2,150	426	1,315	-	2,985	38.8 %
Shore	WD	970	764	0	-	7,283	154.3 %
	WE	100	130	0	-	283	255.0 %
Total Period A		14,397	1,931	10,613	-	18,181	26.3 %
Period B (1400-2159)							
Guided	WD	1,221	285	661	-	1,781	45.8 %
	WE	653	259	146	-	2,899	77.6 %
Unguided	WD	1,908	290	1,339	-	2,477	29.8 %
	WE	1,959	847	299	-	1,348	84.7 %
Shore	WD	679	635	0	-	1,066	183.2 %
	WE	0	0	0	-	0	
Total Period B		6,420	1,163	4,141	-	8,699	35.5 %
Total August		20,817	2,254	16,400	-	25,234	21.2 %
SEPTEMBER							
Period A (0800-1359)							
Guided	WD	3,092	750	1,623	-	4,561	47.5 %
	WE	1,738	429	896	-	7,112	48.4 %
Unguided	WD	2,978	815	1,381	-	4,575	53.6 %
	WE	2,316	456	1,423	-	3,209	38.6 %
Shore	WD	151	154	0	-	452	199.6 %
	WE	372	244	0	-	851	128.7 %
Total Period A		10,647	1,304	8,091	-	13,203	24.0 %
Period B (1400-1959)							
Guided	WD	635	202	239	-	1,031	62.4 %
	WE	218	116	0	-	445	104.3 %
Unguided	WD	908	290	341	-	1,475	62.5 %
	WE	192	98	0	-	384	99.8 %
Shore	WD	190	143	0	-	470	147.2 %
	WE	4	4	0	-	13	218.0 %
Total Period B		2,147	410	1,344	-	2,950	37.4 %
Total September		12,794	1,367	10,115	-	15,473	20.9 %

^a WE = Weekend, WD = Weekday.

Table 3. Estimated catch during each stratum of the sport fishery for coho salmon in the downstream section of the Kenai River, 1992.

Angler Type	WE/WD ^a	Estimated Catch	Standard Error	95% Confidence Interval	Relative Precision
<u>AUGUST</u>					
Period A (0600-1359)					
Guided	WD	5,301	1,380	2,596 - 8,006	51.0 %
	WE	2,394	574	1,268 - 3,520	47.0 %
Unguided	WD	3,537	855	1,861 - 5,213	47.4 %
	WE	2,150	426	1,315 - 2,985	38.8 %
Shore	WD	970	764	0 - 2,467	154.3 %
	WE	100	130	0 - 355	255.0 %
Total Period A		14,452	1,936	10,658 - 18,246	26.2 %
Period B (1400-2159)					
Guided	WD	1,221	285	661 - 1,781	45.8 %
	WE	663	267	140 - 1,186	78.9 %
Unguided	WD	1,908	290	1,339 - 2,477	29.8 %
	WE	2,036	894	284 - 3,788	86.0 %
Shore	WD	679	635	0 - 1,923	183.2 %
	WE	0	0	0 - 0	
Total Period B		6,507	1,199	4,156 - 8,858	36.1 %
Total August		20,959	2,277	16,496 - 25,422	21.3 %
<u>SEPTEMBER</u>					
Period A (0800-1359)					
Guided	WD	3,092	750	1,623 - 4,561	47.5 %
	WE	1,738	429	896 - 2,580	48.4 %
Unguided	WD	2,978	815	1,381 - 4,575	53.6 %
	WE	2,328	454	1,438 - 3,218	38.2 %
Shore	WD	151	154	0 - 452	
	WE	372	244	0 - 851	
Total Period A		10,659	1,304	8,104 - 13,214	24.0 %
Period B (1400-1959)					
Guided	WD	635	202	239 - 1,031	62.4 %
	WE	218	116	0 - 445	104.3 %
Unguided	WD	908	290	341 - 1,475	62.5 %
	WE	192	98	0 - 384	99.8 %
Shore	WD	190	143	0 - 470	
	WE	4	4	0 - 13	
Total Period B		2,147	410	1,344 - 2,950	37.4 %
Total September		12,806	1,367	10,128 - 15,484	20.9 %

^a WE = Weekend, WD = Weekday.

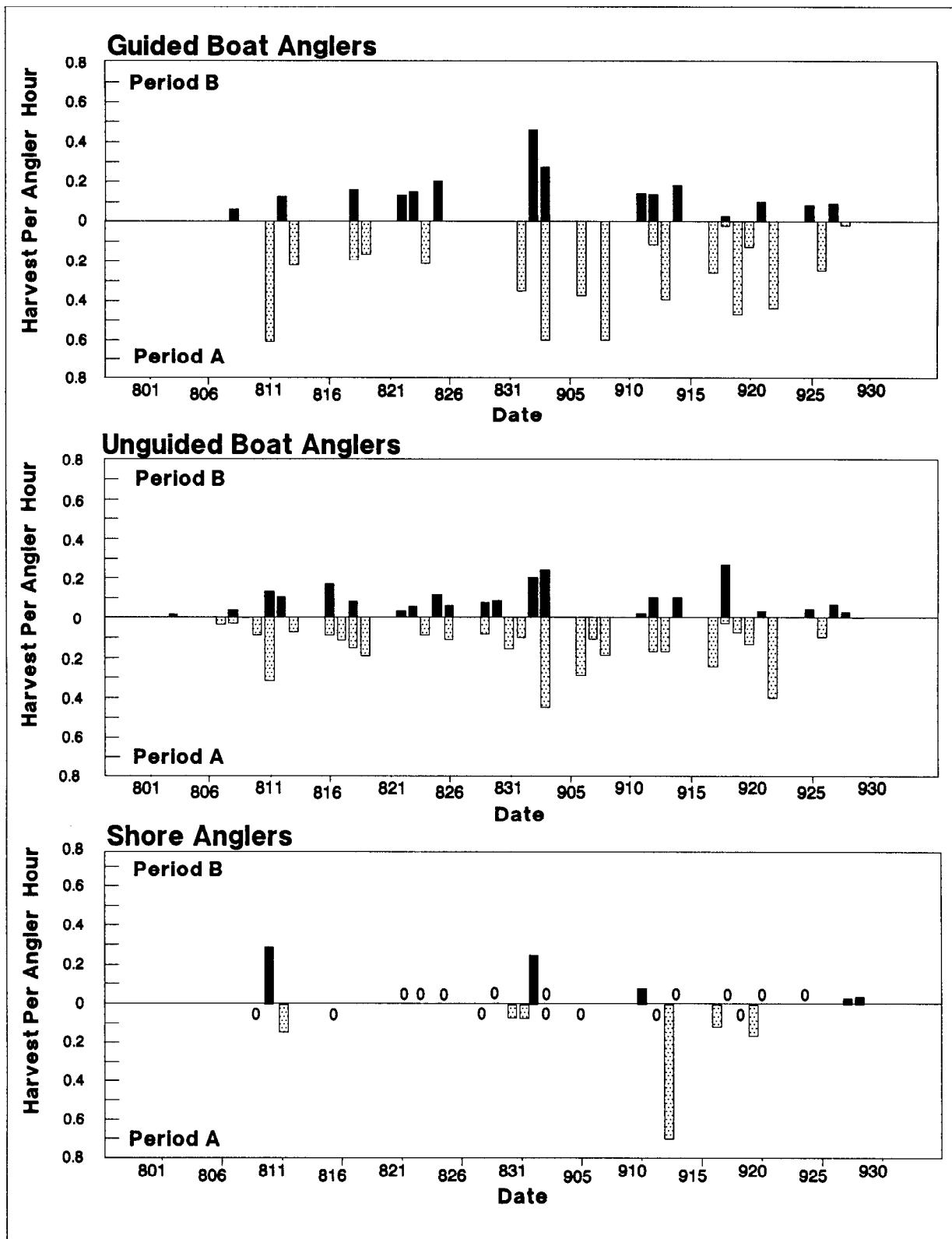


Figure 3. Number of coho salmon harvested per angler-hour by recreational anglers fishing in the downstream section of the Kenai River, 1 August through 28 September 1992.

Table 4. Summary of angler effort, harvest, HPUE, catch, and CPUE of coho salmon during August and September in the downstream section of the Kenai River, 1992.

			Harvest		Catch	
	WE/WD ^a	Effort	Estimate	HPUE ^b	Estimate	CPUE ^c
<u>August</u>						
Guided	WD	32,601	6,506	0.1996	6,522	0.2001
	WE	17,267	3,047	0.1765	3,057	0.1770
Unguided	WD	50,476	5,406	0.1071	5,445	0.1079
	WE	46,334	4,109	0.0887	4,186	0.0903
Shore	WD	17,430	1,649	0.0946	1,649	0.0946
	WE	12,446	100	0.0080	100	0.0080
Total WD		100,507	13,561	0.1349	13,616	0.1355
Total WE		76,047	7,256	0.0954	7,343	0.0966
Total Guided		49,867	9,553	0.1916	9,579	0.1921
Total Unguided		96,810	9,515	0.0983	9,631	0.0995
Total Shore		29,876	1,749	0.0585	1,749	0.0585
TOTAL AUGUST		176,554	20,817	0.1179	20,959	0.1187
<u>September</u>						
Guided	WD	13,957	3,727	0.2670	3,727	0.2670
	WE	6,797	1,956	0.2878	1,956	0.2878
Unguided	WD	20,387	3,886	0.1906	3,886	0.1906
	WE	15,345	2,508	0.1634	2,520	0.1642
Shore	WD	5,692	341	0.0599	341	0.0599
	WE	3,342	376	0.1125	376	0.1125
Total WD		40,036	7,954	0.1987	7,954	0.1987
Total WE		25,484	4,840	0.1899	4,852	0.1904
Total Guided		20,753	5,683	0.2738	5,683	0.2738
Total Unguided		35,732	6,394	0.1789	6,406	0.1793
Total Shore		9,034	717	0.0794	717	0.0794
TOTAL September		65,520	12,794	0.1953	12,806	0.1955
GRAND TOTAL		242,074	33,611	0.1388	33,765	0.1395

^a WD = weekday, WE = weekend

^b Harvest per angler-hour

^c Catch per angler-hour

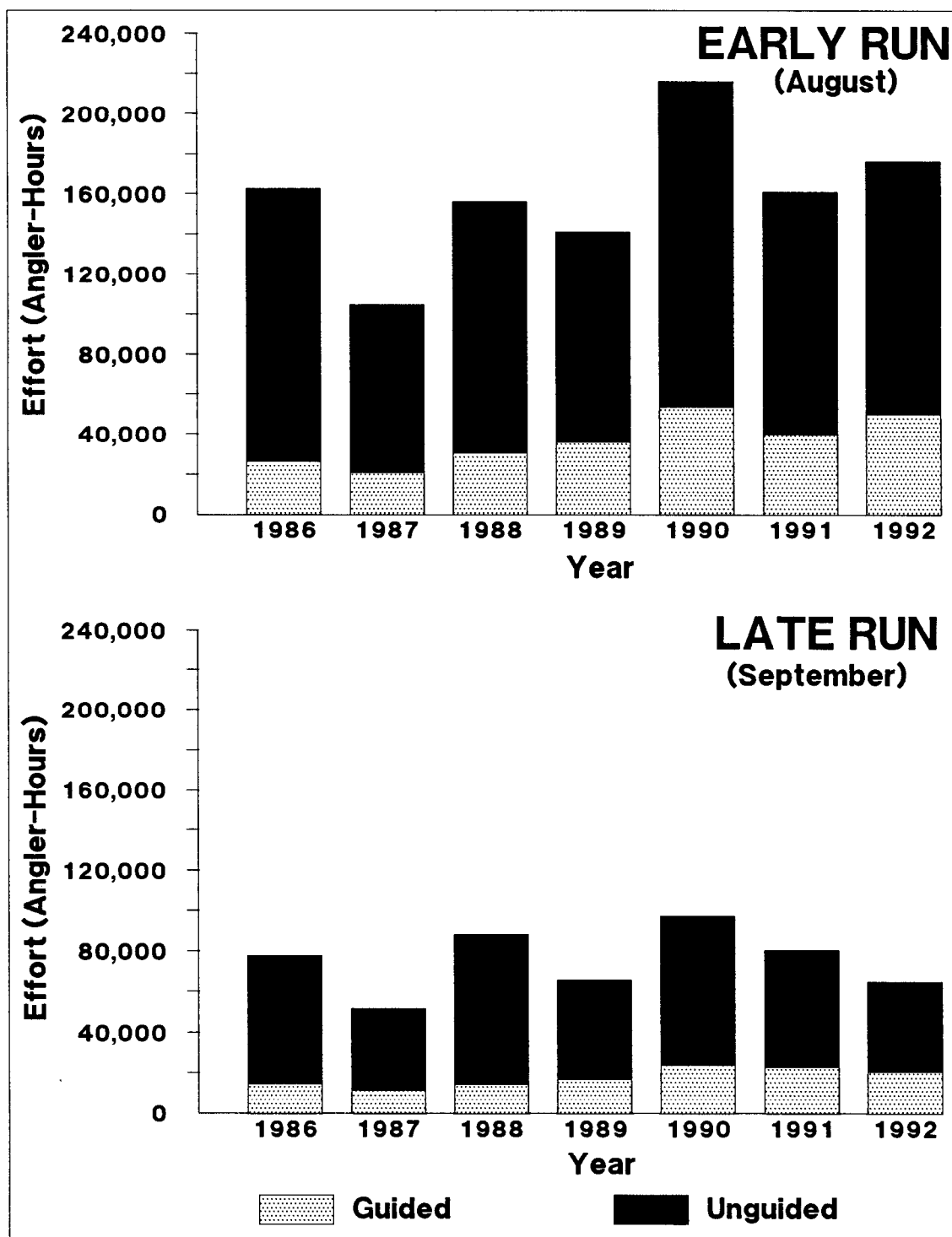


Figure 4. Historical effort of guided and unguided anglers (includes both boat and shore anglers) in the recreational fishery for coho salmon in the downstream section of the Kenai River, 1986-1992.

Table 5. Estimated number, by sex and age class, of coho salmon harvested by the recreational fishery in the downstream section of the Kenai River, 1992.

Stratum	Sex	Statistic	Age Group				Total
			1.1	2.1	3.1	Other	
August (n=229)	Male	Sample Size	27	103	3	1	134
		Percent	11.8	45.0	1.3	0.4	58.5
		SE	2.14	3.29	0.75	0.44	3.26
		Number	2,454	9,363	273	91	12,181
		SE	929	3,229	174	91	
	Female	Sample Size	23	65	6	1	95
		Percent	10.0	28.4	2.6	0.4	41.5
		SE	1.99	2.99	1.06	0.44	3.26
		Number	2,091	5,909	545	91	8,636
		SE	807	2,080	277	91	
	Combined	Sample Size	50	168	9	2	229
		Percent	21.8	73.4	3.9	0.9	100.0
		SE	2.74	2.93	1.29	0.62	0.00
		Number	4,545	15,272	818	182	20,817
		SE	1,627	5,192	374	135	2,254
September (n=235)	Male	Sample Size	4	119	6	1	130
		Percent	1.7	50.6	2.6	0	55.3
		SE	0.85	3.27	1.03	0.43	3.25
		Number	218	6,479	327	54	7,078
		SE	119	1,747	153	54	
	Female	Sample Size	4	94	6	1	105
		Percent	1.7	40.0	2.6	0	44.7
		SE	0.85	3.20	1.03	0.43	3.25
		Number	218	5,118	327	54	5,716
		SE	119	1,400	153	54	
	Combined	Sample Size	8	213	12	2	235
		Percent	3.4	90.6	5.1	1	100.0
		SE	1.19	1.90	1.44	0.60	0.00
		Number	436	11,596	653	109	12,794
		SE	186	3,052	247	79	1,367

Table 6. Age composition and mean length at age of coho salmon sampled from the recreational harvest during the fishery for coho salmon in the downstream section of the Kenai River, 1992.

Stratum	Statistic	Sex	Age Group				Total
			1.1	2.1	3.1	Other	
August	Percent	Male	11.8	45.0	1.3	0.4	58.5
		Female	10.0	28.4	2.6	0.4	41.5
		Combined	21.8	73.4	3.9	0.9	100.0
		SE	2.7	2.9	0.6	1.3	
	Mean Length (mm) ^a	Male	607	616	663	665	
		SE	7	6	30		
		Sample size	27	103	3	1	134
		Female	607	618	586	600	
		SE	11	5	25		
		Sample size	23	64	6	1	94
September	Percent	Male	1.7	50.6	2.6	0.4	55.3
		Female	1.7	40.0	2.6	0.4	44.7
		Combined	3.4	90.6	5.1	0.9	100.0
		SE	1.2	1.9	1.4	0.6	
	Mean Length (mm) ^a	Male	643	645	646	675	
		SE	22	4	32		
		Sample size	4	119	6	1	130
		Female	664	634	653	465	
		SE	21	5	14		
		Sample size	4	94	6	1	105

^a Lengths were measured mid-eye to fork of tail.

during the early run (Table 6). This relationship was observed in other age classes, but sample sizes were insufficient to detect a significant difference. The 2.1 age class was further stratified into 2-week periods within each run to determine if significant differences in mean lengths existed within a run. During the early run, there was no significant difference in mean length between periods for females ($t = 0.87$, $df = 62$, $P = 0.39$) or for males ($t = 1.55$, $df = 101$, $P = 0.12$).

During the late run, males ($t = 1.95$, $df = 117$, $P = 0.05$) and females ($t = 3.64$, $df = 92$, $P < 0.001$) age 2.1 sampled the last 2 weeks of September had greater mean length than those sampled the first 2 weeks of September. Since coho salmon grow rapidly during their last several months in salt water, these differences are not surprising.

RECOMMENDATIONS

With the increased effort and harvest occurring during weekday and morning periods, it may be advisable to restructure the creel survey, placing greater emphasis on sampling these periods. Also, there was a discrepancy during the early run between the proportion of total effort (counts) made up of shore anglers (17%) and the proportion of angler interviews that were of shore anglers (3%). In many sample periods, no shore anglers were interviewed, although the angler counts show that many shore anglers were present. When this occurred, we set the catch and harvest by shore anglers to 0. This problem also occasionally happened with guided anglers. This may cause a biased estimate of harvest and catch by shore anglers and guided anglers. Creel personnel should be stationed at areas where they can interview more shore and guided boat anglers.

As part of a program to determine the coho salmon population size, wild fingerling and smolt were marked with coded wire tags in 1991 and 1992 (Carlson 1992). In order to establish a marked-to-unmarked ratio (additional objective for 1993), an estimated 4,000 adult coho salmon will have to be sampled from the recreational harvest in 1993 (Meyer et al. *Unpublished*). In order to achieve that level of sampling, additional sampling effort will be required.

ACKNOWLEDGMENTS

I would like to express my gratitude to those individuals who assisted with data collection and analysis. Phil Sheridan conducted the boat creel survey and resolved many of the mechanical problems. Ed Borden assisted with the boat creel survey and conducted angler interviews. Michelle Savoie and Joy Langston conducted angler interviews at the selected launch facilities. Jay Carlson and Larry Marsh provided assistance with computer programming. Much gratitude is extended to Steve Hammarstrom for his guidance and support. I also thank the Research and Technical Service staff, especially Sandy Sonnichsen and Jim Hasbrouck, for providing valuable technical assistance with the creel survey program and data analysis.

LITERATURE CITED

- Booth, J. 1990. Run timing and spawning distribution of coho salmon (*Oncorhynchus kisutch*) in the Kenai River, Alaska and their relation to harvest strategies. Master's thesis. Montana State University, Bozeman.
- Carlson, J. 1992. Feasibility of capturing and marking juvenile coho salmon for stock assessment in the Kenai River. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 92-57. Anchorage.
- Cochran, W. G. 1977. Sampling techniques. Third edition. John Wiley and Sons, New York.
- Conrad, R. H. and S. L. Hammarstrom. 1987. Harvest of chinook salmon *Oncorhynchus tshawytscha* and coho salmon *O. kisutch* and angler-effort by the lower Kenai River recreational fisheries, 1986. Alaska Department of Fish and Game, Division of Sport Fish, Fishery Data Series No. 6. Juneau.
- DiCostanzo, C. J. 1956. Creel census techniques and harvest of fishes in Clear Lake, Iowa. Ph.D. dissertation, Iowa State College, Ames, Iowa.
- Efron, B. 1982. The jackknife, the bootstrap and other resampling plans. Society for Industrial and Applied Mathematics, CBMS-NSF Monograph 38, Philadelphia, Pennsylvania.
- Goodman, L. A. 1960. On the exact variance of products. Journal American Statistical Association 55:708-713.
- Hammarstrom, S. L. 1977. Inventory and cataloging of Kenai Peninsula, Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1976-1977, Project F-9-9, 18 (G-I-C):29-46. Juneau.
- _____. 1978. Inventory and cataloging of Kenai Peninsula, Cook Inlet and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1977-1978, Project F-9-10, 19 (G-I-C):42-56. Juneau.
- _____. 1988. Angler effort and harvest of chinook salmon *Oncorhynchus tshawytscha* and coho salmon *O. kisutch* by the recreational fisheries in the lower Kenai River, 1987. Alaska Department of Fish and Game. Fishery Data Series No. 50. Juneau.
- _____. 1989. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1988. Alaska Department of Fish and Game. Fishery Data Series No. 100. Juneau.
- _____. 1990. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1989. Alaska Department of Fish and Game. Fishery Data Series No. 90-22. Anchorage.

LITERATURE CITED (Continued)

- _____. 1991. Angler effort and harvest of chinook salmon and coho salmon by the recreational fisheries in the lower Kenai River, 1990. Alaska Department of Fish and Game. Fishery Data Series No. 91-44. Anchorage.
- Hammarstrom, S. L. and L. L. Larson. 1986. Cook Inlet chinook and coho salmon studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-9-18, 27 (G-32-1,2,4,5):1-56. Juneau.
- Hammarstrom, S. L., L. L. Larson, M. Wenger, and J. Carlon. 1985. Kenai River chinook and coho salmon studies/Kenai River chinook salmon hook and release study. Alaska Department of Fish and Game, Federal Aid in Fish Restoration/Anadromous Fish Study, Annual Performance Report, 1984-1985, Project F-9-17/AFS-50, 26 (G-II-L). Juneau.
- Jones & Stokes Associates, Inc. 1987. Southcentral Alaska sport fishing economic study. Final research report. November 1987. (JSA86-0413.) Sacramento, CA. Prepared for Alaska Department of Fish and Game, Sport Fish Division, Research and Technical Services Section, Anchorage, AK.
- Meyer, S. C., D. Vincent-Lang, and D. McBride. *Unpublished*. Goal statement and study plan for the development of a stock assessment program for upper Cook Inlet coho salmon stocks. Located at Alaska Department of Fish and Game, Division of Sport Fish, 333 Raspberry Road, Anchorage, AK.
- Mills, M. 1979. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (SW-1). Juneau.
- _____. 1980. Alaska statewide sport fish harvest studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (SW-1). Juneau.
- _____. 1981a. Alaska statewide sport fish harvest studies (1979). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A). Juneau.
- _____. 1981b. Alaska statewide sport fish harvest studies (1980). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (SW-I-A). Juneau.
- _____. 1982. Alaska statewide sport fish harvest studies (1981). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (SW-1). Juneau.
- _____. 1983. Alaska statewide sport fish harvest studies (1982). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (SW-1). Juneau.

LITERATURE CITED (Continued)

- _____. 1984. Alaska statewide sport fish harvest studies (1983). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984. Project F-9-16, 25 (SW-1-A). Juneau.
- _____. 1985. Alaska statewide sport fish harvest studies (1984). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1984-1985, Project F-9-17, 26 (SW-1-A). Juneau.
- _____. 1986. Alaska statewide sport fish harvest studies (1985). Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1985-1986, Project F-10-1, 27 (RT-2). Juneau.
- _____. 1987. Alaska statewide sport fisheries harvest report 1986. Alaska Department of Fish and Game, Fishery Data Series No. 2. Juneau.
- _____. 1988. Alaska statewide sport fisheries harvest report 1987. Alaska Department of Fish and Game, Fishery Data Series No. 52. Juneau.
- _____. 1989. Alaska statewide sport fisheries harvest report 1988. Alaska Department of Fish and Game, Fishery Data Series No. 122. Juneau.
- _____. 1990. Harvest and participation in Alaska sport fisheries during 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-44. Anchorage.
- _____. 1991. Harvest, catch, and participation in Alaska sport fisheries during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-58. Anchorage.
- _____. 1992. Harvest, catch, and participation in Alaska sport fisheries during 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-40. Anchorage.
- Neuhold, J. M. and K. H. Lu. 1957. Creel census methods. Utah State Department of Fish and Game, Publ. 8, Salt Lake City, Utah.
- Scheaffer, R. L., W. Mendenhall, and L. Ott. 1979. Elementary survey sampling. Duxbury Press, North Scituate, Mass.
- Scarnecchia, D. L. 1979. Variation of scale characteristics of coho salmon with location on body. Prog. Fish Cult. 41(3):132-135.
- Thompson, S. K. 1987. Sample size for estimating multinomial proportions. The American Statistician 41(1):42-46.
- Wallis, J. and S. L. Hammarstrom. 1979. Inventory and cataloging of Kenai Peninsula and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1978-1979, Project F-9-11, 20 (G-I-C):49-96. Juneau.

LITERATURE CITED (Continued)

- _____. 1980. Inventory and cataloging of Kenai Peninsula and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1979-1980, Project F-9-12, 21 (G-I-C):59-90. Juneau.
- _____. 1981. Inventory and cataloging of Kenai Peninsula and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1980-1981, Project F-9-13, 22 (G-I-C):33-61. Juneau.
- _____. 1982. Inventory and cataloging of Kenai Peninsula and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1981-1982, Project F-9-14, 23 (G-I-C):45-75. Juneau.
- _____. 1983. Inventory and cataloging of Kenai Peninsula and Cook Inlet drainages and fish stocks. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1982-1983, Project F-9-15, 24 (G-I-C):27-58. Juneau.
- _____. 1984. Kenai Peninsula/Lower Cook Inlet angler use and stock assessment studies. Alaska Department of Fish and Game, Federal Aid in Fish Restoration, Annual Performance Report, 1983-1984, Project F-9-16, 25 (G-I-C):1-35. Juneau.

APPENDIX A

Counts of anglers during the creel survey of the fishery for coho salmon in the downstream section of the Kenai River, Alaska, 1992.

Appendix A1. Angler counts by stratum during the recreational fishery for coho salmon in the downstream section of the Kenai River, during August 1992.

DATE	Day Type ^c	<u>GUIDED ANGLERS</u>						<u>UNGUIDED ANGLERS</u>						<u>SHORE ANGLERS</u>					
		<u>PERIOD A^a</u>			<u>PERIOD B^b</u>			<u>PERIOD A</u>			<u>PERIOD B</u>			<u>PERIOD A</u>			<u>PERIOD B</u>		
		Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3
8/02	WE				56	121	13				101	52	101				34	59	37
8/06	WD	77	82	74				23	43	52				3	11	17			
8/07	WD	96	90	83	61	45	35	63	82	83	75	85	81	13	34	37	34	23	31
8/08	WE	180	173	143	66	49	30	184	227	250	225	211	186	67	93	100	78	71	69
8/09	WE	99	149	145				72	143	152				18	36	45			
8/10	WD	173	145	93	78	47	0	118	104	105	109	156	154	92	111	82	76	49	42
8/11	WD				111	83	10				180	154	132				93	86	54
8/12	WD	230	253	209				170	205	169				75	87	55			
8/15	WE	260	241	182	124	89	52	564	540	490	486	476	406	156	143	122	99	78	72
8/16	WE	171	194	189				309	399	368				48	53	42			
8/17	WD	155	200	173	92	36	7	225	240	308	232	165	139	84	92	112	94	56	43
8/18	WD	142	185	235				172	283	359				55	67	72			
8/21	WD				169	164	25				283	270	169				92	81	73
8/22	WE				117	80	35				436	362	295				72	363	56
8/23	WE	190	189	152				359	420	437				86	92	99			
8/24	WD				84	57	4				124	120	47				57	43	21
8/25	WD	174	170	116	103	55	27	172	164	174	149	132	110	38	32	26	118	27	18
8/28	WD	113	112	92	61	28	13	200	203	194	142	128	122	35	39	37	89	43	39
8/29	WE				57	47	13				269	249	222				62	44	43
8/30	WE	63	68	41				219	210	107				44	40	32			
8/31	WD	72	66	60				70	112	129				0	12	41			

^a 0600 to 1359 hours

^b 1400 to 2159 hours

^c WE = Weekend, WD = Weekday

Appendix A2. Angler counts by stratum during the recreational fishery for coho salmon in the downstream section of the Kenai River, during September 1992.

DATE	Day Type ^c	<u>GUIDED ANGLERS</u>						<u>UNGUIDED ANGLERS</u>						<u>SHORE ANGLERS</u>					
		<u>PERIOD A^a</u>			<u>PERIOD B^b</u>			<u>PERIOD A</u>			<u>PERIOD B</u>			<u>PERIOD A</u>			<u>PERIOD B</u>		
		Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3	Count #1	Count #2	Count #3
9/01	WD				56	16	11				102	68	75				60	16	24
9/02	WD	122	113	92	55	51	18	166	154	143	106	88	68	56	45	69	59	49	25
9/05	WE	164	165	134	55	50	29	274	334	282	72	71	69	72	82	55	22	16	15
9/06	WE	134	101	82				303	241	140				51	56	67			
9/07	WE	110	117	95				352	335	372				52	66	104			
9/10	WD				55	50	29				72	71	69				22	16	15
9/11	WD	168	148	134	44	106	18	185	180	165	98	114	73	22	18	17	34	24	30
9/12	WE	173	144	125				311	294	281				21	36	49			
9/13	WE				81	64	3				144	104	57				28	32	22
9/16	WD	137	118	80				151	158	82				15	8	115			
9/17	WD	127	114	105	22	11	0	176	141	51	17	17	29	29	26	29	23	11	3
9/18	WD	99	106	80				165	154	80				15	19	13			
9/19	WE	114	86					241	233					16	20				
9/20	WE				42	8	0				72	23	26				27	24	9
9/21	WD	44	40					94	71					12	21				
9/24	WD				9	5	0				33	35	31				14	11	8
9/25	WD	47	51	48				48	54	66							11	14	13
9/26	WE				24	13	10				33	25	19				22	12	13
9/27	WE	24	7	5	4	4	4	21	18	12	21	19	13	11	12	11	8	7	6
9/28	WD				0	0	0				9	8	6				8	7	6

^a 0600 to 1359 hours

^b 1400 to 2159 hours

^c WE = Weekend, WD = Weekday

APPENDIX B

Daily summary statistics for fishing effort, harvest rate,
and catch rate for anglers interviewed during the fishery
for coho salmon in the downstream section of the Kenai River,
Alaska, 1992.

Appendix B1. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE and catch by stratum for guided boat anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
8/02	WE	B	323	8,197	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/06	WD	A	621	475	30	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/07	WD	A	717	453	6	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/07	WD	B	376	1,899	6	0.0638	0.0008	24	122	0.0638	0.0008	24	122
8/08	WE	A	1,323	5,061	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/08	WE	B	387	3,467	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/09	WE	A	1,048	13,419	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/10	WD	A	1,096	18,603	38	0.6068	0.0012	665	8,327	0.6125	0.0014	671	8,576
8/10	WD	B	333	16,907	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/11	WD	B	544	32,603	20	0.1259	0.0013	68	867	0.1259	0.0013	68	867
8/12	WD	A	1,845	13,147	10	0.2200	0.0066	406	23,100	0.2200	0.0066	406	23,100
8/15	WE	A	1,821	20,491	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/15	WE	B	707	13,835	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/16	WE	A	1,477	2,955	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/17	WD	A	1,408	14,688	6	0.1944	0.0063	274	13,006	0.1944	0.0063	274	13,006
8/17	WD	B	360	21,211	11	0.1610	0.0022	58	786	0.1610	0.0022	58	786
8/18	WD	A	1,499	23,195	2	0.1667	0.0278	250	62,389	0.1667	0.0278	250	62,389
8/21	WD	B	955	103,179	29	0.1324	0.0006	126	2,305	0.1324	0.0006	126	2,305
8/22	WE	B	619	18,101	43	0.1510	0.0004	93	572	0.1541	0.0004	95	593
8/23	WE	A	1,416	7,307	21	0.2127	0.0009	301	2,145	0.2127	0.0009	301	2,145
8/24	WD	B	387	18,869	22	0.2031	0.0011	79	917	0.2031	0.0011	79	917
8/25	WD	A	1,227	15,637	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/25	WD	B	493	16,469	18	0.0087	0.0001	4	18	0.0087	0.0001	4	18
8/28	WD	A	845	2,139	14	0.2763	0.0016	234	1,321	0.2763	0.0016	234	1,321
8/28	WD	B	272	7,008	26	0.1735	0.0013	47	296	0.1735	0.0013	47	296
8/29	WE	B	312	6,699	14	0.1195	0.0011	37	192	0.1195	0.0011	37	192
8/30	WE	A	459	4,021	11	0.3869	0.0094	177	2,536	0.3869	0.0094	177	2,536
8/31	WD	A	528	384	21	0.3504	0.0028	185	817	0.3504	0.0028	185	817

^a WE = Weekend, WD = Weekday

^b Period A = 0600-1359, B = 1400-2159

^c Number of anglers interviewed

Appendix B2. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for unguided boat anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
8/02	WE	B	861	4,267	32	0.0168	0.0001	14	104	0.0168	0.0001	14	104
8/06	WD	A	315	2,565	6	0.0356	0.0011	11	109	0.0356	0.0011	11	109
8/07	WD	A	643	619	13	0.0414	0.0007	27	303	0.0414	0.0007	27	303
8/07	WD	B	608	1,931	15	0.0309	0.0004	19	156	0.0309	0.0004	19	156
8/08	WE	A	1,659	4,379	24	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/08	WE	B	1,763	12,683	6	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/09	WE	A	979	27,317	12	0.0871	0.0032	85	3,222	0.0871	0.0032	85	3,222
8/10	WD	A	872	1,051	23	0.3154	0.0047	275	3,651	0.3154	0.0047	275	3,651
8/10	WD	B	1,117	11,803	10	0.1318	0.0047	147	5,975	0.1318	0.0047	147	5,975
8/11	WD	B	1,243	6,187	23	0.1059	0.0008	132	1,240	0.1059	0.0008	132	1,240
8/12	WD	A	1,451	13,445	36	0.0732	0.0006	106	1,311	0.0732	0.0006	106	1,311
8/15	WE	A	3,648	26,667	22	0.1699	0.0030	620	40,960	0.1805	0.0029	658	39,435
8/15	WE	B	4,251	16,405	30	0.0876	0.0005	372	9,603	0.0876	0.0005	372	9,603
8/16	WE	A	2,869	48,325	77	0.1133	0.0004	325	3,860	0.1133	0.0004	325	3,860
8/17	WD	A	1,429	27,547	47	0.0826	0.0003	118	817	0.0826	0.0003	118	817
8/17	WD	B	2,061	25,861	45	0.1510	0.0012	311	5,575	0.1510	0.0012	311	5,575
8/18	WD	A	2,171	96,517	9	0.1901	0.0147	413	71,332	0.1901	0.0147	413	71,332
8/21	WD	B	1,925	55,307	67	0.0338	0.0001	65	416	0.0338	0.0001	65	416
8/22	WE	B	2,915	53,147	90	0.0586	0.0001	171	1,225	0.0586	0.0001	171	1,225
8/23	WE	A	3,243	21,387	74	0.0878	0.0005	285	4,986	0.0878	0.0005	285	4,986
8/24	WD	B	776	28,507	30	0.1175	0.0009	91	919	0.1175	0.0009	91	919
8/25	WD	A	1,360	875	11	0.1113	0.0019	151	3,476	0.1113	0.0019	151	3,476
8/25	WD	B	1,043	4,123	9	0.0630	0.0011	66	1,218	0.0630	0.0011	66	1,218
8/28	WD	A	1,592	480	20	0.0814	0.0011	130	2,812	0.0814	0.0011	130	2,812
8/28	WD	B	1,045	1,237	25	0.0780	0.0005	82	559	0.0780	0.0005	82	559
8/29	WE	B	1,973	6,021	44	0.0884	0.0003	175	1,074	0.0884	0.0003	175	1,074
8/30	WE	A	1,429	57,013	49	0.1560	0.0010	223	3,319	0.1560	0.0010	223	3,319
8/31	WD	A	829	10,949	33	0.1005	0.0008	83	635	0.1205	0.0019	100	1,451

^a WE = Weekend, WD = Weekday

^b Period A = 0600-1359, B = 1400-2159

^c Number of anglers interviewed

Appendix B3. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for shore anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during August 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
8/02	WE	B	347	5,915	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/06	WD	A	83	533	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/07	WD	A	224	2,400	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/07	WD	B	235	987	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/08	WE	A	693	3,867	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/08	WE	B	581	283	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/09	WE	A	264	2,160	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/10	WD	A	445	4,149	3	0.2905	0.0144	129	3,155	0.2905	0.0144	129	3,155
8/10	WD	B	760	6,411	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/11	WD	B	621	5,723	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/12	WD	A	579	6,229	4	0.1429	0.0145	83	4,878	0.1429	0.0145	83	4,878
8/15	WE	A	664	2,544	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/15	WE	B	1,123	3,253	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/16	WE	A	381	779	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/17	WD	A	768	2,475	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/17	WD	B	515	8,603	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/18	WD	A	517	901	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/21	WD	B	656	987	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/22	WE	B	1,309	954,293	4	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/23	WE	A	739	453	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/24	WD	B	323	3,627	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/25	WD	A	256	384	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/25	WD	B	168	864	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/28	WD	A	456	11,371	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/28	WD	B	296	107	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/29	WE	B	397	1,733	8	0.0000	0.0000	0	0	0.0000	0.0000	0	0
8/30	WE	A	309	427	6	0.0650	0.0046	20	443	0.0650	0.0046	20	443
8/31	WD	A	141	5,253	8	0.0687	0.0049	10	96	0.0687	0.0049	10	96

^a WE = Weekend, WD = Weekday

^b Period A = 0600-1359, B = 1400-2159

^c Number of anglers interviewed

Appendix B4. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for guided anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
9/01	WD	B	166	4,875	5	0.4605	0.0030	76	1,102	0.4605	0.0030	76	1,102
9/02	WD	A	654	1,566	4	0.6000	0.0000	392	564	0.6000	0.0000	392	564
9/02	WD	B	248	3,315	12	0.2747	0.0020	68	369	0.2747	0.0020	68	369
9/05	WE	A	926	2,886	16	0.3750	0.0084	347	7,619	0.3750	0.0084	347	7,619
9/06	WE	A	634	4,350	17	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/07	WE	A	644	1,599	5	0.6000	0.0000	386	576	0.6000	0.0000	386	576
9/10	WD	B	268	1,398	18	0.1431	0.0011	38	108	0.1431	0.0011	38	108
9/11	WD	A	900	1,788	8	0.1150	0.0015	103	1,207	0.1150	0.0015	103	1,207
9/11	WD	B	336	34,764	20	0.1393	0.0014	47	781	0.1393	0.0014	47	781
9/12	WE	A	884	3,606	7	0.3929	0.0115	347	9,486	0.3929	0.0115	347	9,486
9/13	WE	B	296	12,030	28	0.1824	0.0006	54	446	0.1824	0.0006	54	446
9/16	WD	A	670	5,415	12	0.2597	0.0049	174	2,540	0.2597	0.0049	174	2,540
9/17	WD	A	692	750	11	0.0231	0.0005	16	262	0.0231	0.0005	16	262
9/17	WD	B	66	726	17	0.0274	0.0002	2	1	0.0274	0.0002	2	1
9/18	WD	A	570	2,175	9	0.4730	0.0034	270	1,585	0.4730	0.0034	270	1,585
9/19	WE	A	600	7,056	10	0.1266	0.0044	76	1,675	0.1266	0.0044	76	1,675
9/20	WE	B	100	3,660	19	0.0999	0.0010	10	43	0.0999	0.0010	10	43
9/21	WD	A	252	144	11	0.4395	0.0065	111	437	0.4395	0.0065	111	437
9/24	WD	B	28	123	5	0.0846	0.0039	2	3	0.0846	0.0039	2	3
9/25	WD	A	292	75	4	0.2500	0.0023	73	202	0.2500	0.0023	73	202
9/26	WE	B	94	390	13	0.0939	0.0018	9	19	0.0939	0.0018	9	19
9/27	WE	A	72	879	20	0.0218	0.0002	2	1	0.0218	0.0002	2	1
9/27	WE	B	24	0	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/28	WD	B	0	0	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0

^a WE = Weekend, WD = Weekday

^b Period A = 0800-1359, B = 1400-2000

^c Number of anglers interviewed

Appendix B5. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for unguided anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
9/01	WD	B	490	3,615	17	0.2023	0.0017	99	550	0.2023	0.0017	99	550
9/02	WD	A	926	795	14	0.4483	0.0123	415	10,738	0.4483	0.0123	415	10,738
9/02	WD	B	524	2,172	13	0.2398	0.0020	126	677	0.2398	0.0020	126	677
9/05	WE	A	1,780	18,912	42	0.2900	0.0023	516	8,859	0.2900	0.0023	516	8,859
9/06	WE	A	1,368	42,135	54	0.1062	0.0009	145	2,060	0.1119	0.0009	153	2,098
9/07	WE	A	2,118	4,974	15	0.1878	0.0040	398	18,195	0.1878	0.0040	398	18,195
9/10	WD	B	424	15	25	0.0210	0.0004	9	78	0.0210	0.0004	9	78
9/11	WD	A	570	5,811	23	0.1014	0.0010	58	382	0.1014	0.0010	58	382
9/11	WD	B	1,060	750	19	0.1670	0.0030	177	3,421	0.1670	0.0030	177	3,421
9/12	WE	A	1,772	1,374	66	0.1681	0.0007	298	2,216	0.1681	0.0007	298	2,216
9/13	WE	B	610	11,427	45	0.1033	0.0005	63	289	0.1033	0.0005	63	289
9/16	WD	A	782	17,475	23	0.2426	0.0021	190	2,249	0.2426	0.0021	190	2,249
9/17	WD	A	126	432	4	0.2701	0.0357	34	583	0.2701	0.0357	34	583
9/17	WD	B	736	27,975	23	0.0312	0.0005	23	286	0.0312	0.0005	23	286
9/18	WD	A	798	16,791	28	0.0758	0.0007	60	547	0.0758	0.0007	60	547
9/19	WE	A	1,422	576	36	0.1317	0.0019	187	3,831	0.1317	0.0019	187	3,831
9/20	WE	B	242	7,230	47	0.0354	0.0002	9	20	0.0354	0.0002	9	20
9/21	WD	A	495	4,761	14	0.4015	0.0051	199	2,002	0.4015	0.0051	199	2,002
9/24	WD	B	198	60	20	0.0451	0.0005	9	21	0.0451	0.0005	9	21
9/25	WD	A	336	540	10	0.0986	0.0028	33	319	0.0986	0.0028	33	319
9/26	WE	B	154	300	22	0.0680	0.0005	10	14	0.0680	0.0005	10	14
9/27	WE	A	102	135	5	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/27	WE	B	106	120	10	0.0298	0.0004	3	5	0.0298	0.0004	3	5
9/28	WD	B	46	15	3	0.0000	0.0000	0	0	0.0000	0.0000	0	0

^a WE = Weekend, WD = Weekday

^b Period A = 0800-1359, B = 1400-2000

^c Number of anglers interviewed

Appendix B6. Daily summary statistics for fishing effort, number of anglers interviewed, and coho salmon HPUE, harvest, CPUE, and catch by stratum for shore anglers interviewed during the fishery for coho salmon in the downstream section of the Kenai River during September 1992.

Date	Day Type ^a	Period ^b	Estimated		Ang Int ^c	HPUE		Estimated		CPUE		Estimated	
			Effort	Variance		Mean	Variance	Harvest	Variance	Mean	Variance	Catch	Variance
9/01	WD	B	200	6,000	16	0.2504	0.0054	50	559	0.2504	0.0054	50	559
9/02	WD	A	340	2,091	11	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/02	WD	B	266	2,028	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/05	WE	A	418	2,487	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/06	WE	A	348	438	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/07	WE	A	444	4,920	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/10	WD	B	106	111	9	0.0772	0.0008	8	10	0.0772	0.0008	8	10
9/11	WD	A	176	408	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/11	WD	B	114	51	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/12	WE	A	212	1,182	4	0.6973	0.0064	148	855	0.6973	0.0064	148	855
9/13	WE	B	164	348	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/16	WD	A	276	34,494	8	0.1154	0.0048	32	660	0.1154	0.0048	32	660
9/17	WD	A	74	624	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/17	WD	B	168	54	1	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/18	WD	A	94	156	11	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/19	WE	A	108	144	7	0.1601	0.0079	17	95	0.1601	0.0079	17	95
9/20	WE	B	120	702	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/21	WD	A	99	729	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/24	WD	B	66	54	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/25	WD	A	76	30	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/26	WE	B	94	303	0	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/27	WE	A	68	6	2	0.0000	0.0000	0	0	0.0000	0.0000	0	0
9/27	WE	B	42	6	8	0.0297	0.0009	1	2	0.0297	0.0009	1	2
9/28	WD	B	42	6	9	0.0376	0.0006	2	1	0.0376	0.0006	2	1

^a WE = Weekend, WD = Weekday

^b Period A = 0800-1359, B = 1400-2000

^c Number of anglers interviewed

